NONLINEAR RESPONSE OF SEMICONDUCTOR BRAGG REFLECTORS

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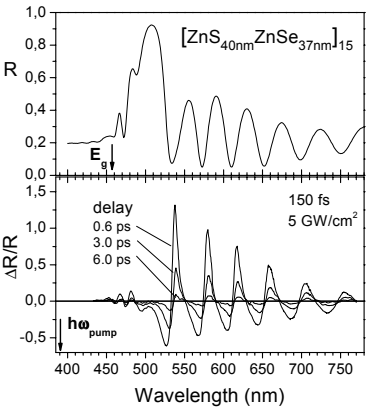

A nonlinear periodic structure is proposed and developed with the purposeful use of strong resonant intrinsic interband absorption in a semiconductor material, which causes modification of the material refraction index in the spectral range corresponding to morphological resonances formed by the periodicity of the structure. In the experiments, periodic ZnSe/ZnS heterostructures have been used and interband excitation of a ZnSe sublattice has been performed by nano-, pico- and femtosecond laser pulses. A considerable shift of reflection spectrum and large relative reflection changes were observed in a wide spectral range corresponding to the transparency region of ZnSe far from the intrinsic absorption onset. Evaluated refraction index change is about −0.05, the relaxation time being as short as 3 picoseconds. Relative reflection coefficient change exceeds 100%. In case of femtosecond excitation, a wide-band nonlinear response is observed for both one-photon near UV- and two-photon near IR-pulses. The nonlinearity relaxation time is supposed to depend a transition from non-equilibrium to quasi-equilibrium distribution of electrons and holes within ZnSe conduction and valence band, respectively, rather than electron-hole recombination time.